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AGROTECHNOLOGY AND FOOD RESOURCES

No. 1

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USSR REPORT
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ALL-UNION CONFERENCE 'PROBLEMS OF THE SELECTIVITY AND MECHANISM OF ACTION OF ORGANOPHOSPHORIC INSECTICIDE-ACARICIDES'

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA BIOLOGICHESKAYA in Russian No 1, 1980 pp 150-154

[Article by N. I. Aronova and V. A. Dubovitskiy]

[Text] The all-union conference "Problems of the Selectivity and Mechanism of Action of Organophosphoric Insecticide-Acaricides", organized by the USSR Academy of Sciences Scientific Council for Elemento-Organic Chemistry and the Armenian SSR branch of the All-Union Scientific Research Institute of Hygiene and Toxicology of Pesticides, Polymers, and Plastics, was held in Yerevan.

The conference participants included more than 60 persons from Moscow, Leningrad, Kiev, Tashkent, Nal'chik, Yerevan, and Kazan' representing institutes of the USSR Academy of Sciences (the Institute of Elemento-Organic Compounds--INEOS, the Institute of Evolutionary Physiology and Biochemistry imeni I. M. Sechenov--IEFB), the USSR Academy of Sciences Scientific Council for Elemento-Organic Chemistry, the USSR Academy of Sciences Presidium's Commission for Scientific Fundamentals of Agriculture, the Ministry of Chemical Industry (All-Union Scientific Research Institute of Chemical Means of Plant Protection--VNIKhSZR), the USSR Ministry of Public Health (VNIIGINTOKS [All-Union Scientific Research Institute of Hygiene and Toxicology of Pesticides, Polymers, and Plastics] and its Armenian branch), the academies of sciences of the union republics (the Uzbek SSR Academy of Sciences Institute of Zoology and Parasitology, The Ukrainian SSR Academy of Sciences Institute of Organic Chemistry, The Uzbek SSR Academy of Sciences Institute of Bio-Organic Chemistry), VASKhNIL (All-Union Institute of Plant Protection--VIZR), and institutions of higher education (Kabardino-Balkar State University--KBGU, Leningrad Medical Institute No 1--I LMI).

The conference program included the following issues: modern trends in the development of organophosphoric pesticide (OPP) chemistry, research on synthesis of new substances and analysis of their chemical and toxicological properties, the physiological and biochemical mechanisms of

action and metabolism of various organophosphoric compounds (OPC) in homeotherms and arthropods, problems concerning the causes behind the selective action and biochemical mechanisms of habituation, and others.

M. I. Kabachnik noted in his introductory remarks that the approach to protecting plants from pests underwent change in the last decade. While the 1940's-1950's were dominated by chemical compounds intended for pest extermination, and these were the only types of compounds available, in the early 1960's and especially in the 1970's we came to recognize the value of integrated methods based on a scientifically grounded, sensible combination of different means of controlling harmful organisms: selection of resistant strains, chemical and biological plant protection resources, proper agricultural practices, and so on. In addition, the chemical means of protecting plants against harmful organisms now occupies a leading position, and will continue to do so in the future.

The requirements imposed on pesticides rose significantly in recent years; in addition to studying the effectiveness and safety of use, we must now analyze the remote consequences of their application.

There are three ways to find new preparations.

1. The trial-and-error method, which has resulted in the overwhelming majority of today's pesticides. It is becoming increasingly more expensive; only one out of every ten thousand synthesized substances is introduced as a preparation.
2. The screening method--mass analysis of all new substances. This method is being developed successfully today by the Ministry of Chemical Industry VNIICHSZR.
3. Scientifically grounded synthesis. This method of searching for new pesticides is based on deep analysis of the comparative physiology and biochemistry of useful and harmful organisms, analysis of the mechanism of action and metabolism of chemicals in the bodies of different species, and construction, on this foundation, of a sensible system for finding new highly effective preparations satisfying modern requirements.

High selectivity of action is one of the main requirements imposed today on new preparations. It may be attained by various means. The first is based on mechanism of action. Most OPC's have an anticholinesterase action. Cholinesterase inhibition in arthropods plays a great role in their poisoning by OPC's. The second is based on metabolic differences, which depend on the structure of the compound and metabolism in the body; these differences have to do with direction of action, speed, and biological consequences.

The USSR Ministry of Public Health VNIIGINTOKS was represented by three reports.

Yu. S. Kagan's review "Pressing Problems in Research on the Pathogenic Properties and Selectivity of Organophosphoric Pesticides" analyzed the carcinogenic, mutagenic, embryotoxic, and teratogenic properties of OPP's. It described the results of research on the carcinogenic activity of chlorofos and the embryotoxic and teratogenic action of phthalophos, and it presented data on the weak cytogenic activity of a number of OPP's containing methoxyl groups. The role of phthalophos metabolites in the mechanism of this preparation's embryotoxic and teratogenic action is demonstrated. The prospects for obtaining OPP's breaking down into natural metabolites are given. Directed regulation of OPP metabolism with the help of inducers and inhibitors of oxidases having combined functions is demonstrated to be possible. Use of such inducers and inhibitors raises the selective toxicity of such preparations to arthropods and reduces their toxicity to man.

Ye. A. Yershova's report "Analysis of the Toxic Properties of New Organophosphoric Pesticides" discussed the directed influence some OPP's have on the bodies of homeothermic animals. The possibility of controlling toxicity by several means is demonstrated. One of them is to model the structure of OPP's with the goal of intensifying detoxification in the warm-blooded animal's body. The other means is to affect the activity of enzymes responsible for OPP metabolism, particularly combined-function oxidases (CFO). It is demonstrated that the toxicity of preparation EG-20 was reduced with the help of the inhibitor OSF-TMTD, which weakens oxidative desulfuration. The toxicity of heterophos was reduced by an CFO inducer--mitran, which elicits preferential intensification of detoxification in the body.

A report by L. M. Sasinovich et al. proposed a new approach to the treatment of organophosphoric pesticide poisonings.

The Armenian branch of the VNIIGINTOKS was represented by three reports: "Toxicology of New Organophosphoric Growth Regulators" by S. G. Gevorkyan and A. G. Akopyan, "Effect of Organophosphoric Plant Growth Regulators on Liver CFO Activity" by S. G. Gevorkyan and O. Z. Nagashyan, and "The Possibilities for Predicting the Toxicity and Nature of Anticholinesterase Action of Bromophos" by G. Ts. Aslanyan.

The first two reports presented data from research on plant growth regulators made from 2-chlorethylphosphonic acid, toxicological experiments, the remote consequences of their use, and their effect on liver combined-function oxidases. The third report discussed the possibilities of predicting the toxicity and nature of anticholinesterase action of bromophos.

The USSR Academy of Sciences IEFB was represented by two reports: "Interaction of Cholinesterases and Carboxyesterases of Insect Nervous Tissue With Organophosphoric Inhibitors" by I. L. Brik, A. P. Brestkin, and Yu. E. Mandel'shtam, and "Sensitivity of Gangliar Cholinesterase in

the Locust and Cockroach to O-Alkyl-S-(Carbomethoxymethylmercaptomethyl) Methylthiophosphonates With O-Alkyl Radicals of Different Lengths" by Z. Tilyabov.

The first report noted that there are two types of enzymes highly sensitive to OPP's in the animal body--cholinesterases (CE) and carboxyesterases (CBE). CE's are enzymes that play the main role in transmission of nerve impulses. The toxicity of OPP's depends on their inhibitory action upon CE. CBE's participates in lipid metabolism. Large quantities of CBE are present in insect hemolymph, which delivers the insecticide-acaricide to the nerve synapse, where CE's are concentrated. CBE's play a role in OPC detoxification. The authors studied the differences in catalytic properties and sensitivity of these enzymes to various OPC's in order to reveal the mechanism of the action of these preparations. Experiments were performed with the locust and the American cockroach--large insects from which it is easy to isolate nerve ganglia and study the properties of the CE's they contain. Work has now been started to isolate and analyze CE from a dangerous agricultural pest--the greenbug. The second report was devoted to research on the sensitivity of CE and CBE from the locust and American cockroach to various methylthiophosphonates. It was demonstrated that sulfonium methylthiophosphonates--selective inhibitors of mammalian acetylcholinesterase (ACE)--are selective inhibitors of CE from the locust and the American cockroach, and the compounds containing a complex ester grouping in the portion of the molecule that splits off are selective inhibitors of CBE in these insects.

A. A. Rakitin's report "Physiological Action of Diazinon and Diazokson on the Central Nervous System of the Winter Moth Caterpillar" (VIZR VASKhNIL) presented information on the action of the insecticide diazinon, and its anticholinesterase acid analog, diazokson, on different nervous system components of the caterpillar of the winter moth, a dangerous agricultural pest. The author recorded the bioelectric activity of the central nervous system and of motor and sensory neurons. He established with *in vivo* and *in vitro* experiments that the cholinergic system is disturbed and transmission of nerve impulses by various neurons is blocked, which agrees with the anticholinesterase mechanism of action of OPC upon insects. An original technique of *in vivo* determination of neuron bioelectric activity was developed.

N. N. Mel'nikov gave the review "Modern Trends in the Development of Organophosphoric Pesticide Chemistry." He dwelled on the present directions in development of research having to do with creation of new effective OPP's. A sense of the scale of OPP research may be gained from the fact that just in the last 3 years alone, about 1,000 patents were published, describing more than 20,000 chemical compounds having pesticide activity of one sort or another. However, despite the wealth of papers on the action of OPC's and on the dependence of activity upon structure, there is still much to do before we gain a complete understanding of this problem.

The Ukrainian SSR Academy of Sciences Institute of Organic Chemistry was represented by two reports: "Insecticide-Acaricide Properties of Phosphorylated Derivatives of Dextramine and Its Optic Analogs" by A. S. Shtepanek, T. N. Kudrya, and Yu. V. Karabanov, and "The Role of Complex Formation in Inhibition of ACE by Organophosphoric Compounds" by Yu. G. Gololobov et al.

The former of these provides information on synthesis of new phosphorylated derivatives of dextramine--a major waste product of the synthesis of the antibiotic levomycetin having significant insecticide-acaricide, fungicide, and nematocide activity, while being mildly toxic to homeotherms. It was demonstrated that some dextramine derivatives, especially dextramine itself (Preparation 1274), are very promising plant growth regulators, and that they may be used as chemical means for raising the yield of spring and winter crops.

The latter report demonstrated that relative change in aryl- and vinyl-phosphates, used as ACE inhibitors, depends on the stage of formation of enzyme-inhibiting complexes, the strength of which declines significantly when the phosphorus atom is shielded by alkyl radicals. In parallel, the toxicity of these compounds to homeotherms decreases, while insecticide properties are maintained, making it possible to employ α -shielding as an empirical method of purposeful alteration of the toxicological characteristics of pesticides.

S. A. Zhuravskaya et al., scientists from the Uzbek SSR Academy of Sciences Institute of Zoology and Parasitology, presented two reports, "Some Problems in Research on the Mechanism Behind the Selectivity of Organophosphoric Insecticide-Acaricides, With Cotton Pests and Their Entomophages as the Example" and "The Results of Research on the Insecticide-Acaricide Activity of Preparations MSh-1 and NSH-6." The former paper discussed the activity of CBE and phosphatase on dangerous cotton pests--the cotton aphid and the spider mite, and their entomophages--the common aphid lion and *Stethorus*. It was established that these pests are typified by enzymes having relatively lower activity and a narrower isoenzyme spectrum in comparison with the entomophages. The second paper summarizes the results of research on the insecticide-acaricide activity of two new OPC's synthesized by the USSR Academy of Sciences INEOS.

A report by I. G. Shcherbak, L. A. Romanchuk, and S. S. Mikhaylov, "Metabolism and Distribution of Chlorofos in the Homeothermic Body" (I LMI) showed that chlorofos and its toxic product --dichlorofos--undergo transformation in the homeothermic body only by means of a spontaneous, nonenzymatic process. Dichlorofos is in turn detoxified extremely quickly by different enzyme systems, especially in the liver, kidneys, the wall of the small intestine, and blood. The liver effectively extracts chlorofos and metabolites from blood and excretes them together with bile into the intestinal lumen, where the most favorable conditions exist for transformation of chlorofos into dichlorofos, as well as for

subsequent detoxification of dichlorofos. That part of the dichlorofos which is assimilated in the intestine winds up mainly in tissues that are richest in enzymes detoxifying this poison (intestinal walls, blood, liver). Hepatic-intestinal circulation of OPC's that are effectively extracted from blood by the liver is one of the important mechanisms of detoxification of these substances in homeotherms.

Joint reports (prepared by several institutes) were a typical feature of the conference.

A report by S. A. Roslavtseva et al. (Ministry of Chemical Industry VNIKhSZR, USSR Academy of Sciences INEOS), "Investigation of Insecticide-Acaricide Properties of Organothiophosphoric Derivatives of Mercaptoacetic Acid", discussed the biological activity of derivatives of methylphosphonic acid, which contains, within the portion of the molecule that splits off, a carbalkoxyl group with the general formula:



where X represents O or S, R represents Alk, and R₁ represents lower alkyls. Insecticide activity decreased as the number of carbon atoms in R increased from three to eight. In flies, anticholinesterase activity increases as the length of the radical grows. Toxicity to homeotherms was less with dithio-analogs than with monothio-compounds. The hypothesis that toxicity to homeotherms decreases when a carbalkoxyl group is introduced into the timet [thiometh-?] structure was confirmed.

A report by A. S. Sedykh et al. (Ministry of Chemical Industry VNIKhSZR, KAGU, USSR Academy of Sciences INEOS) discussed selective toxicity of the compounds YeSh-7, YeSh-53, and its oxygen analog YeSh-55 to different species of arthropods. The compound YeSh-55 turned out to be the most active insecticide-acaricide.

The report "Synthesis and Insecticide Properties of Some New Organothiophosphoric Amino Acid Derivatives" by A. E. Shipov (USSR Academy of Sciences INEOS, Ministry of Chemical Industry VNIKhSZR, USSR Academy of Sciences IEFB, USSR Ministry of Public Health VNIIGINTOKS) communicated information on the synthesis of a number of new derivatives of dithioacids of phosphorus containing fragments of N-carbalkoxylated or cyclic amino acid derivatives. It was demonstrated that as with organophosphoric amino acid derivatives previously studied by the authors, the new compounds display pronounced selective action in relation to some species of arthropods in a number of cases, while displaying moderate toxicity in relation to homeotherms.

The report "Mechanism of Selective Toxicity of New OPC's Containing Heterocyclic Groupings" by O. Ye. Sherstobitov et al. (USSR Academy of Sciences IEFB, I IMI, VIZR VASKhNIL, Uzbek SSR Academy of Sciences Institute of

Bio-Organic Chemistry) presented data from research on two series of new OPC's (dialkylthio phosphates) containing, within the portion that splits off, a residue of the natural alkaloid lupinine, or its stereoisomer--epilupinine. It is demonstrated that lengthening the O-alkyl radical in the phosphoryl part of the molecule has different influences upon the anticholinesterase activity of the compound, and upon the enzymes of mammals and arthropods (spider mites, greenbug, housefly, rice weevil, and mealy bug). While the action of the compounds upon mammalian acetylcholinesterase increased as the length of the O-alkyl radical was lengthened, their action upon the arthropod enzyme decreased. This attests to differences in the structure of the enzyme's esterase centers in mammals and arthropods. It was also established that the capability for sorption upon lipidophilic surfaces depends not only on the size of the O-alkyl radicals but also on the nature of the heterocycle. Epilupinine derivatives sorbed significantly more intensively than did lupinine derivatives. These facts may be utilized in the synthesis of selective insecticide-acaricides.

In their report "Insecticide-Acaricide Activity of S-Butylphosphates" L. A. Vikhreva et al. (USSR Academy of Sciences INEOS, Ministry of Chemical Industry VNIKhSIZ, USSR Academy of Sciences IEPB) demonstrated that new propargylic thiophosphates and dithiophosphates manifest significant insecticide-acaricide activity and have selective action toward various species of arthropods. It was found that their toxicity to mice correlates with the human ACE inhibition rate constants; however, the role of the acetyline bond in biological processes remains unclear.

The report "Enzymatic Hydrolysis of Akreks" by Yu. G. Zhukovskiy et al. (USSR Academy of Sciences IEPB, Ministry of Chemical Industry VNIKhSIZ) presented information on the role of enzymatic hydrolysis of a highly selective insecticide-acaricide--akreks, the toxic action of which is associated with dinitrophenol formed upon its hydrolysis. It is demonstrated that akreks is not hydrolyzed by CE, and that other enzymes--arylesterases--are more likely responsible for hydrolysis.

Two reports were given by representatives from VIER VASKhNIL and the USSR Academy of Sciences IEPB: "Isolation and Purification of Acetylcholinesterase From the Greenbug" by Ye. B. Mayzel' and I. N. Sazonova, and "Selective Sensitivity of Different Species of Aphids and Other Insects of Order Homoptera to Some Cholinesterase Inhibitors" by I. N. Sazonova, Ye. V. Kozlova, and Ye. B. Mayzel'. The former presents the results of the first attempt, in the USSR and abroad, at isolating and purifying acetylcholinesterase from the greenbug, and it describes detailed investigation of its properties by the method of substrate-inhibitor analysis. Some fundamental differences are revealed between enzymes from the greenbug and human ACE, which opens up the prospects for creating specific aphicides. Extensive research was performed on a "unique" property of greenbug CE--its sensitivity to SH-toxins--using 21 species of insects in order Homoptera, and a fundamental difference

was revealed, in relation to this characteristic, in the ACE of insects in suborder Aphidinea and other suborders (cicadas, coccids, white flies, and leafhoppers). The second report analyzed problems concerning the relationship of structure to toxicity, to the selective anticholinesterase activity of different OPC's in relation to a large number of agricultural pests, as well as to the properties of target enzymes and detoxifying enzymes, and the action of OPC's upon insect nervous system components.

The report "Some Features of the Toxicological Action of Methylphosphonic Compounds With Radicals of Different Lengths" by A. N. Pedin et al. (USSR Academy of Sciences IIFB and USSR Academy of Sciences INEOS) demonstrated that the toxicity of these compounds in relation to the American cockroach does not correlate with their inhibitory activity. Electrophysiological experiments established that compounds having radicals from two to five carbon atoms long penetrate readily into the central nervous system (CNS). Compounds with radicals six carbon or atoms long and longer penetrate into the CNS poorly--ganglionic sheaths are a significant obstacle. It is difficult to explain the difference in the biochemical and toxicological results of compounds with short radicals by penetration alone. There are probably some other factors within the mechanism of action of these compounds upon the cockroach CNS.

The report "Toxic and Anticholinesterase Action of OPC Sh-141 and Sh-156 Stereoisomers Upon Spider Mites" by O. V. Sundukov et al. (VIER VASKhNIL, USSR Academy of Sciences INEOS) discussed the toxicity of stereoisomers of organothiophosphoric compounds containing amino acid residues and their action upon the esterase activity of the common spider mite and the (koryayshnikovyy) mite. The authors studied the acaricide action of stereoisomers of thio-derivatives of valine, and they discussed the relationship of differences in their stereospecificity of inhibition and their carboxyesterase activity in mites.

In his concluding remarks, M. I. Kabachnik said that important changes have occurred in research on selectivity and the mechanism of action of organophosphoric insecticide-acaricides: First, deeper research is being conducted on the mechanism of action of OPC's upon homeothermic animals; second, research on the physiology and biochemistry of arthropods exposed to insecticide-acaricides has enjoyed greater development; third, a transition from the "trial-and-error" method to the directed OPC synthesis method has been noted among synthetic chemists.

It was noted that integrated research is being conducted, in which the most diverse specialists are participating: chemists, biochemists, biologists, toxicologists, physiologists, physicians, and so on; what is most important is that all specialists understand each other quite well.

The conference ended with adoption of a resolution.
[562-11004]

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IMPLEMENTATION OF SCIENTIFIC ADVANCEMENTS IN AGRICULTURE

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79
pp 801-805

MUROMTSEV, G.S., All-Union Scientific Research Institute of Applied Molecular
Biology and Genetics, Moscow

[Abstract] A rationale is presented for the greater implementation of the latest advancements of molecular biology and genetics in plant and animal husbandry at the Soviet state and collective farms. While the ideological climate is such that great progress is being made along these lines, even greater success can be assured by closer cooperation between the research establishments and farm managers and an open attitude toward new discoveries.
[564-12172]

UDC 633.18:631.5

SCIENTISTS WORKING FOR A MILLION TONS OF KUBAN RICE

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 6, 1979 pp 806-810
manuscript received 16 Oct 78

ALESHIN, YE. P. and GRIGOR'YAN, A.G., All-Union Scientific Research Institute of Rice, Krasnodar

[Abstract] A summary is presented of the research being undertaken at the All-Union Scientific Research Institute of Rice in Krasnodar in order to assure the production of 1 million tons of rice in the Kuban in the not too distant future. References 8 Russian.
[564-12172]

BIOCHEMISTRY

UDC [616-056.43-02:613.2]-074

STRUCTURE AND PROPERTIES OF FOOD ALLERGENS

Moscow VOPROSY PITANIYA in Russian No 1, Jan-Feb 80 pp 3-10 manuscript received 5 Feb 79

SHATERNIKOV, V.A., KONYCHEV, V.A. and MAZO, V.K., Institute of Nutrition, USSR Academy of Medical Sciences, Moscow

[Abstract] A survey is made of alimentary allergy, which is a widespread disease (10-15 percent incidence in children and 2-3 percent in adults), including allergy to milk proteins, cod, eggs, oil-containing plants, grains, tomatoes, coffee beans, i.e., in most cases foods referable to simple proteins or glycoproteins. Various biochemical studies are cited, suggesting that a carbohydrate component may be involved in occurrence of hypersensitivity or enhancement thereof. References 76: 7 Russian, 69 Western. [563-10657]

UDC [621.57-9:637.5]:621.3.013.004.15

ANALYSIS OF THE EFFECT OF A CONSTANT MAGNETIC FIELD ON REFRIGERATION OF MEAT PRODUCTS

Moscow MYASNAYA INDUSTRIYA SSSR in Russian No 12, 1979 pp 35-37

YEFIMOV, A.V., MALOVA, N.D., candidate of technical sciences (CTS), and ROSLOVA, A.P., CTS, Moscow Technological Institute of the Meat and Milk Industry

[Abstract] The effect of a constant magnetic field [CMF] on freezing of meat was studied in a specially designed unit, a heat-insulated chamber constructed of brass, stainless steel and textolite, with a temperature range from 40 to -50°C , an air-flow range of 0.5-6 m/sec, a magnetic field of $0-2 \cdot 10^5$ A/m in intensity and a $\pm 0.1^{\circ}\text{C}$ uniformity. Dry ice was the refrigerant. The meat sample was fresh beef, quality grade 1, without fat, connective tissue or large blood vessels. Freezing the meat in a magnetic field made it possible to control heat diffusion within it. Less energy was lost during intensification of freezing of meat in the magnetic field. The increase in power was related only to the acceleration of energy removal; the amount of energy used to create the magnetic field was insignificant. The magnetic field had an insignificant effect on cooling of meat containing water in a droplet state, but intensified crystallization and cooling of meat containing water in a crystalline state. Cryoscopic temperature dropped $0.3-0.5^{\circ}\text{C}$ during freezing of meat in a magnetic field with an intensity of $0.6 \cdot 10^5$ A/m or higher. Optimal magnetic field intensity was $0.4-0.8 \cdot 10^5$ A/m. The intensifying effect of the CMF on thawing appeared only during heating of the frozen product and melting of ice. The weight losses of meat frozen in a CMF decreased by 30 percent during freezing and by 50 percent during thawing, in comparison with freezing without a CMF. Losses of components with meat juice during thawing decreased from 53 to 23 percent. Figures 3; references 10: 8 Russian, 2 Western.
[555-9307]

DIFFERENCES IN THE ELECTRIC POTENTIALS OF GERMINATING AND NONGERMINATING
CORN SEEDS AS AN INDICATOR OF VIABILITY

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79
pp 791-792 manuscript received 4 Aug 78

KURTSOVA, M.S., Agricultural Institute, Gor'kiy

[Abstract] Electrophysiologic studies were conducted on hybrid corn seeds (VIR 44 X VIR 40) to determine whether electric potentials (EP) can be utilized as an indication of viability. Experiments with viable, nonviable, and heat (105°C) killed seeds provided data that such determinations can be used to evaluate seed viability. Immediately prior to germination the viable seeds showed that the EP between the seed bud and the endosperm, and between the embryo root and the budlet, falls sharply and assumes a negative value. Germination sets in following an increase in the EP. Similar phenomena were also noted on removal of the seeds from water. The nonviable and heat killed seeds did not present with a decrease in the EP on attempts at inducing germination. Figures 1; references 5 Russian.
[564-12172]

UDC [628.312:54]:637.513.3

BIOMASS COMPOSITION OF ACTIVATED SLUDGE FROM MEAT-PACKING PLANT PURIFICATION INSTALLATIONS

Moscow MYASNAYA INDUSTRIYA SSSR in Russian No 12, 1979 pp 33-34

SALYUK, A.I., doctor of technical sciences, NIKITIN, G.A., professor, and LEVITINA, N.V., Kiev Technological Institute of the Food Industry

[Abstract] The amino acid and vitamin composition of the biomass of activated sludge formed during the anaerobic-aerobic treatment of waste waters from the Chortkovskii meat-packing plant was analyzed for its possible value as a fodder additive. The biomass contained (in percent of absolute dry matter) 48-59 percent crude protein, 44-56 percent protein, 4.3-7.8 percent fat, 6.0-34 percent cell tissue and 12-24 percent ash. The ash contained major and other trace elements. A kg of dry biomass contained 280 g of amino acids with essential amino acids comprising more than 30 percent of the total. Glutamic and aspartic acids, alanine and cysteine levels were particularly high. Activated sludge exceeded fodder yeast, a protein-vitamin complex and tankage in its methionine, proline and cysteine content. The amino acid content was reduced to 41 percent of its initial level after a 30-day fermentation. However, a 3-4 day anaerobic treatment is feasible, since it did not affect the amino acid total: the quantity of cysteine and arginine decreased, but that of leucine and tyrosine increased. Fermentation partially inactivated pathogenic microflora and reduced their count 100-fold; it improved biomass dehydration and increased the content of group B vitamins, particularly of B₁₂. One g of dry biomass contained 3 μ g B₁, 25 μ g B₂, 90 μ g B₃, 0.7 μ g B₆, 0.2 μ g B₇ and 45 μ g B₁₂. The dehydrated and dried product may be used in the production of protein-vitamin fodder additives. A meat-packing plant can realize a profit of 572,000 rubles/year at a 100-ton production capacity. References 7: 6 Russian, 1 Western. [555-9307]

INSTRUMENTS AND EQUIPMENT

UDC 619:615.47

NEW SEMIAUTOMATIC IP-1 INJECTOR

Moscow VETERNARIYA in Russian No 9, Sep 79 pp 38-39

MIRONOV, A.I., and KOZHEMYAKA, N.V., USSR Poultry Industry

[Abstract] A new semiautomatic IP-1 injector was developed in 1977-1978 for mass scale inoculation of day-old chicks against Marek's disease. A breakdown is given of savings realized with the use of this injector, and its design is illustrated in a figure showing all components, which are also described in the text. Figures 1.
[547-10657]

MICROBIOLOGY

UDC 619:576.858.4:576.809.33:576.8.097.23

INTERACTION OF FMD VIRUS WITH CELLS OF DIFFERENT, CHRONICALLY-INFECTED ANIMALS

Moscow VETERINARIYA in Russian No 9, Sep 79 pp 26-29

SALAZHOV, YE.L., and LEBEDEV, A.I.

[Abstract] Experiments were conducted to develop a model of latent and chronic FMD [foot-and-mouth disease] in a cell population, to determine the mechanisms of persistence of FMD virus and make a comprehensive study of the role and share of different factors involved in biological equilibrium between the cell and virus, since it is difficult to pursue such studies in the intact body. Types A and C FMD virus were used to infect cultures of transferable renal cells of sheep, calves, swine embryos, piglets, as well as trypsinized cultures of pig embryo and cow embryo kidneys. A detailed description is given of doses and conditions under which the cultures were infected. Demonstration of the feasibility of modeling viral persistence on the cellular level is very promising to theory and practice, as it permits studies of viral carriers, insusceptibility of animals and possible natural sources of infection; the technique can also be used for experimental alteration of antigenic structure of viruses. [547-10657]

UDC 619:576.858.75:576.809.31:636.29

ISOLATION OF INFLUENZA VIRUS FROM REINDEER

Moscow VETERINARIYA in Russian No 9, Sep 79 p 32

PYSINA, T.V., L'VOV, D.K., BRAUDE, N.A., SOROCHENKO, V.A., PODCHERNYAYEVA, R.YA., MYASNIKOVA, I.A., and KLIMENKO, S.M.

[Abstract] Type A influenza virus was isolated from reindeer in Chukotskiy National Okrug in 1977. Tests on 9-10 day chick embryos (hemagglutination inhibition reaction, morphological and typing) revealed the virus to be

referable to the 6th avian type (Hav6) with regard to hemagglutinin and 2d type of human Asian influenza virus according to neuraminidase. The virus isolated from reindeer, labeled as A/reindeer/Chukotka/1254/77, differs from its antigenic analogue, A/turkey/Massachusetts/65. Figures 1. [547-10657]

UDC 619:576.858.73

NEW VARIANT OF FOWL INFLUENZA VIRUS

Moscow VETERINARIYA in Russian No 9, 1979 pp 29-31

OSIDZE, N.G., L'VOV, D.K., SYURIN, V.N., SMORZHEVSKAYA, L.S., LENCHENKO, YE. V., RADCHUK, L.A., BRAUDE, N.A., MYASHIKOVA, I.A., PODCHERNYAYEVA, R. YA., KIR'YANOVA, A.I., and SHAYKHANOVA, Z.T.

[Abstract] Diagnostic studies were made of chickens at two poultry industrial farms where there had been an epizootic outbreak of influenza early in 1977, the clinical signs of which differed from those induced by influenza virus serotype 6. Viruses were isolated from the brain and spleen of sick hens, then cultures on chick embryos for identification. The serological tests used are described in detail. A new, previously unknown serological variant of fowl influenza virus was isolated and designated as GP7N1, containing avian hemagglutinin 7 and neuraminidase 1, which is inherent in human influenza virus. There was confirmation of the opinion that the latter is transmitted to fowl that may constitute a reservoir for producing new variants of influenza virus. Figures 1. [547-10657]

UDC [619:616.9-097]:636/52/.58

GENETIC ASPECTS OF CHICKEN RESISTANCE TO DISEASE

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79 pp 741-744 manuscript received 26 Mar 79

MOISEYEVA, I.G., TOLOKONNIKOVA, YE.V., KLEYEBERG, K.V., SEREBRYAKOV, A.S., MELEK, O.I., BESSARABOV, B.F., and LAZBERG, L.K., Institute of General Genetics, USSR Academy of Sciences, Moscow

[Abstract] Various breeds of chickens were investigated for the relationship between genetic polymorphism (ovalbumin, globulins, egg proteins, serum albumin) and resistance to a Newcastle disease vaccine virus, Salmonella pullorum, Escherichia coli, and Mycoplasma gallisepticum infections. The results showed that the markers under study could not be used to follow hereditary resistance to the infections in question in view of the poor correlation between a given marker and susceptibility to a given agent. References 9: 2 Czech, 2 Western, 5 Russian. [564-12172]

PHARMACOLOGY

UDC 619:614.9:616.992.28-084:636.08/.086

ASSAY OF ESTROGENIC MYCOTOXINS IN CONCENTRATED LIVESTOCK FEED

Moscow VETERINARIYA in Russian No 9, Sep 79 pp 23-25

YAKUB, G.G., Experimental Livestock Station, Kishinev Agricultural Institute

[Abstract] Toxicity of maize grain stricken with *Fusarium* fungi was studied in tests on adult rats, white mice and rabbits, as well as paramecia, and failed to demonstrate estrogenic mycotoxins. Tests were then conducted on young rats, in whom it was possible to determine the coefficient of estrogenism as a function of mycotoxin content and duration of intake of contaminated feed. These studies were conducted because excessive intake of contaminated feed causes development of vulvovaginitis, enlargement of the vulva and mammary glands, with occasional prolapse of the vagina and rectum of swine. The method used in testing baby rats was tried on pigs fed contaminated grain and found to be effective for demonstration of estrogenic mycotoxins.

[547-10657]

PLANT BIOCHEMISTRY

UDC 632

BIOLOGICAL ASPECTS OF PROTECTING POTATOES, VEGETABLES AND FRUITS AGAINST STORAGE LOSSES

Moscow IZVESTIYA AKADEMII NAUK SSSR, SERIYA BIOLOGICHESKAYA in Russian No 1, Jan-Feb 80 pp 73-93 manuscript received 11 Aug 79

METLITSKIY, L.V., Institute of Biochemistry imeni A.N. Bakh, USSR Academy of Sciences, Moscow

[Abstract] This is a review discussion of the various factors which cause high storage losses of potatoes, vegetables and fruits, attention is given to studies of the biochemical mechanisms which regulate the resistance of plant tissues to phytopathogenic microorganisms, the resting state and transition to active growth, maturation and aging and methods of controlling these mechanisms to protect crops against infectious diseases and functional disorders, premature sprouting and overripening. Combination methods such as active ventilation, artificial cooling, a regulated gas medium, physiologically active substances, ionization radiation and other methods are effective in prevention of storage losses. References 41: 33 Russian, 8 Western.

[561-unknown]

UDC 632.937.1

CURRENT STATUS AND PERSPECTIVES FOR BIOLOGICAL PLANT PROTECTION IN THE USSR

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79 pp 675-682 manuscript received 15 Dec 78

BONDARENKO, N.V., VORONIN, K. YE., and GRINBERG, SH. M., Leningrad Agricultural Institute; All-Union Scientific Research Institute (AUSRI) of Biological Methods of Plant Protection, Kishinev; AUSRI of Plant Protection, Leningrad

[Abstract] The current status and perspective for biological crop protection in the USSR are reviewed in light of the July 1978 Plenum of the CC of the CPSU on "Further Development of Agriculture in the USSR." At the present time 35 research establishments are engaged in research on

biological plant protection and the creation of new entomophages, under overall coordination of the All-Union Scientific Research Institute of Biological Methods of Plant Protection. An indication of success in this area is provided by the fact that in 1960 only 200 thousand hectares were protected by biological methods, and in 1977 that figure had increased to 13.7 million hectares. Equally important advances have been made in biological weed control, and future plans call for even greater utilization of natural host-parasite relationships in crop management and protection. References 40: Russian. [564-12172]

UDC 631.59"313"+581.132

POTENTIAL PLANT PRODUCTIVITY AND PRINCIPLES OF ITS MAXIMUM UTILIZATION

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79 pp 683-694 manuscript received 15 Aug 79

NICHIPOROVICH, A.A., Institute of Plant Physiology imeni K.A. Timiryazev, USSR Academy of Sciences, Moscow [The author Anatoliy Aleksandrovich, organized research on intensive cultivation of algae and higher plants under controlled conditions in connection with problems pertaining to closed life support systems for cosmonauts and the exploration of outer space]

[Abstract] Consideration is provided to the role of photosynthesis in determining plant productivity as an inseparable component of complex physiologic interactions involving growth processes, assimilation of nutrients, organogenesis, and availability of optimum solar radiation. Theoretical conclusions and practical experience have demonstrated that adaptability of the photosynthetic apparatus to various environmental factors is the key mechanism determining crop productivity since the products of photosynthesis act as regulators of growth and organogenesis. Figures 7; references 18: 1 Western, 17 Russian. [564-12172]

UDC 633.31/.37:631.52

BASIC TRENDS IN LEGUME BREEDING

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79 pp 695-704 manuscript received 15 Feb 79

CHEKALIN, N.M., All-Union Scientific Research Institute of Legume and Grain Crops, Orel

[Abstract] A survey of current trends in legume crop breeding has shown that one of the most promising approaches consists of utilization of transgressive breeding to increase the crop yields. Success rests on selection

of the proper parental forms for hybridization based on their combining ability. By using such an approach it has been possible to obtain leguminous crops (peas, lupin, vetch, beans, soya beans, garbanzo, etc.) with improvements in high quality proteins, disease resistance, drought resistance, increased seed shatter resistance, etc. References 26: 11 Western, 15 Russian.

[564-12172]

UDC 502.61.7

MICROBIOLOGIC FACTORS IN PESTICIDE DETOXIFICATION: A LITERATURE REVIEW

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79
pp 710-715 manuscript received 12 Dec 78

KRUGLOV, YU.V., All-Union Scientific Research Institute of Agricultural Microbiology, Leningrad

[Abstract] A survey of the factors responsible for biodegradation of pesticides and, hence, their detoxification, has revealed the following soil microorganisms to be of prime importance: Pseudomonas, Arthrobacter, Flavobacterium, Brevibacterium, Mycobacterium, Nocardia, Aspergillus, Fusarium, and Penicillium. Evaluation of the biochemical mechanisms has demonstrated the key importance of oxidation, with the recommendation the detoxification be enhanced by soil inoculation with the appropriate microbes, utilization of agricultural practices that facilitate growth of such soil microorganisms, and enrichment of the soil with pertinent enzyme and cosubstrate preparations. Figures 5; references 32: 15 Russian, 17 Western.

[564-12172]

UDC 631.559.2+581.132

PHYSIOLOGIC AND GENETIC ASPECTS OF IMPROVED CROP YIELDS

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79
pp 762-766 manuscript received 21 Jun 79

NASYROV, YU.S., Institute of Plant Physiology and Biophysics, Tadjik SSR, Academy of Sciences, Dushanbe

[Abstract] A review is provided of experience with cotton plants in establishing the physiologic and genetic aspects of plant productivity. It has been postulated and substantiated experimentally that, essentially, photosynthesis is under the control of nuclear and plastid genes and subject to the fine interaction between them. Consequently, while it appears possible to employ standard techniques of genetic engineering in attempting to

regulate photosynthesis, a more profitable approach might be to employ experimental mutagenesis to modify inducible phosphoenolpyruvate isozymes in order to enhance CO₂ transport to the chloroplasts and, thus, to increase photosynthetic efficiency. Figures 5; references 12: 5 Russian, 7 Western. [564-12172]

UDC 636.52/.58.082.12

EFFECTS OF THE DWARFING GENE 'DW' ON THE GROWTH RATE OF EGG LAYING HENS DURING THE PRE-LAYING PERIOD

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79 pp 798-800 manuscript received 9 Mar 78

KOROLEVA, E.A., ZLOCHEVSKAYA, K.V., ZHURAVLEV, I.V., and ZIMNIKOVA, T.A., All-Union Scientific Research and Technical Institute of Poultry Breeding, Zagorsk, Moscow Oblast

[Abstract] Comparative observations on hens with the dwarfing gene (dw-) and their sibs without it (Dw-) showed that the pre-laying period in the former was about 3 days longer than in the latter. The rate of growth, weight gain, and protein-bound phosphorus in the dw- hens decrease during the pre-laying period, while the rate of growth prior to the pre-laying period was approximately equivalent for these two groups of hens. During the 2 week period following the laying of the first egg the dw- hens lost ca. nine percent of their body weight and presented with adrenal hypertrophy. During that period the weight of the Dw- sibs did not change while the adrenal glands decreased in size. Such physiological differences should provide a basis for a more rational utilization of the dw- hens. Figures 2; references 4: Western. [564-12172]

PLANT PATHOLOGY

UDC 615.9-08:661.718.1

EFFECT OF GAMMA-AMINOBUTYRIC ACID, LITHIUM SALTS THEREOF AND SODIUM HYDROXYBUTYRATE ON SYMPTOMATOLOGY OF EXPERIMENTAL ANTICHOLINESTERASE POISONING

Kishinev ZDRAVOOKHRANENIYE in Russian No 4, Jul-Aug 79 pp 23-24 manuscript received 21 Oct 78

ZVEREV, M.I., MATKOVSKIY, K.L., SHYRBUL, G. YE., and RUSSU, A.G., Kishinev Medical Institute (rector: Prof V. Kh. Anestiadi, academician of the Moldavian Academy of Sciences)

[Abstract] GABA (gamma-aminobutyric acid), sodium hydroxybutyrate and lithium salts of GABA were tested as antidotes on albino rats, to the anticholinesterase action of widely used organophosphorus compounds (OPC). These OPC, which disrupt acetylcholine metabolism, are used as insecticides, acaricides, fungicides, herbicides, defoliants, etc., and are highly toxic to man, and even lethal in some cases. GABA given 30 minutes prior to (not-identified) OPC administration, and lithium salt of GABA given after development of tonic-clonic seizures, were effective in increasing animal survival rate.

[548-10657]

UDC 632.954+581.13

PLANT METABOLISM OF HERBICIDES AS A FACTOR IN SELECTIVE TOXICITY: A LITERATURE REVIEW

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79 pp 705-709 manuscript received 19 Mar 79

CHKANIKOV, D.I., All-Union Scientific Research Institute of Phytopathology, B. Vyazemy, Moscow Oblast

[Abstract] Investigations, conducted to establish the metabolic determinants of the selective toxicity of herbicides, have demonstrated that the degree to which herbicides are metabolically inactivated or modified determines their effectiveness. Studies with the widely employed herbicides atarine, 2,4-D, monuron, and propanyl have revealed a sequence of reaction mechanisms that fall into three broad categories: a)oxidation, reduction,

hydroxylation, dehalogenization, dealkylation, and so forth; b) conjugation with endogenous carbohydrates (usually glucose) or amino acids; and c) polymerization or some other process leading to the formation of an insoluble product. The more effective a given plant is in metabolizing a herbicide, the less likely it is to be adversely affected by the herbicide. Figures 4; references 16: 4 Russian, 12 Western. [564-12172]

UDC 633.11"324":[632.4+631.559"314"]

PREDICTION OF POSSIBLE LOSSES IN WINTER WHEAT HARVEST DUE TO YELLOW RUST

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79 pp 782-787 manuscript received 12 Dec 77

TEREKHOV, V.I., KAYDASH, A.S., BESSMEL'TSEV, V.I., SOLODUKHINA, L.D., and KOLESNIKOVA, V.I., North Caucasian Scientific Research Institute of Phytopathology, Krasnodar

[Abstract] A mathematical analysis of factors contributing to the spread of yellow rust and resultant crop losses has shown that the most important factor in European USSR favoring yellow rust is the level of precipitation. For purposes of predicting crop losses due to yellow rust a nomogram was constructed which yielded ca. 70 percent coincidence with actual losses. Figure 3; references 9: Russian. [564-12172]

UDC 633.11"324":632.452

ASCORBIC ACID AS A FACTOR IN THE RESISTANCE OF WINTER WHEAT TO BROWN LEAF RUST (HISTOCHEMICAL STUDIES)

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79 pp 794-795 manuscript received 28 Dec 77

LOBAN', V.L., Ukrainian Agricultural Academy, Kiev

[Abstract] Histochemical studies were conducted during the 1975-1977 period on susceptible (Mironovskaya 808, Il'ichevka) and resistant (No 208/8-8, No 208/8-11) winter wheat varieties infected with race 77 of the brown wheat rust agent (*Puccinia triticina*) to determine the fate of ascorbic acid at the site of lesion. The results showed that, at the start of the infection, levels of reduced ascorbic acid were increased to a much greater extent in the resistant plants than in the susceptible varieties. With progression--at the stage of fungal sporulation--levels of reduced ascorbic acid fell and eventually became undetectable in the susceptible plants. In the resistant plants both reduced and oxidized ascorbic acid continued to accumulate and the reduced form was also observed in various

fungus structures. The appearance of oxidized vitamin C at the site of lesion and in adjacent areas was interpreted to indicate greater inactivation of fungal toxin(s). References 5: 1 Ukrainian, 4 Russian. [564-12172]

UDC 633.11:581.19:632.952

CHEMICAL 'IMMUNIZATION' OF WHEAT WITH FUNGICIDES AND ITS EFFECTS ON CONCENTRATION AND FUNCTION OF PLANT NUCLEIC ACIDS

Moscow SEL'SKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian Vol 14 No 6, Nov-Dec 79 pp 796-798 manuscript received 18 Oct 77

TYUTEREV, S.L., KHALEZOVA, L.A., and FEDOROVA, F.A., All-Union Scientific Research Institute of Plant Protection, Leningrad

[Abstract] Studies were conducted on the effects of various chemical "immunizing" agents on nucleic acid metabolism of Amurskaya 74 wheat. The results showed that treatment of the seeds with certain fungicides (plantvaks, indar, benomil/anilat mixture, and preparations 1822 and 1823) led to earlier aging of the plant leaves and depressed levels of RNA. These findings indicate that the effects of fungicide treatment of the seeds on the plants can be evaluated from the depressed RNA/DNA ratios.

References 7: Russian.

[564-12172]

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